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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/910,914	07/24/2001	Kie Y. Ahn	M4065.0461/P461	2806
24998	7590	03/05/2004	EXAMINER	
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP			FOURSON III, GEORGE R	
2101 L STREET NW			ART UNIT	
WASHINGTON, DC 20037-1526			PAPER NUMBER	

2823

DATE MAILED: 03/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/910,914

Applicant(s)

AHN ET AL.

Examiner

George Fourson

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 28 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9,11-14,16-19 and 21-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9,11-14,16-19 and 21-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- 1) ☐ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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*The finality of the office action mailed 10/28/03 is withdrawn.*

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior

Office action.

Claim 4 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 1 requires patterning as recited in claim 4.

Claims 1-9, 16-19, 21-24, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Huang et al (6313028), of record, and applicant's admitted prior art (AAPA).

Huang et al discloses formation of interlayer dielectric 206 using a low-k material formed by a spin-on method, formation of an opening in layer 206, formation of  $WN_x$  barrier layer 212 in contact with the opening, CMP of layer 212 to remove from horizontal surfaces, selective CVD of Cu 214 and CMP of the Cu layer 214 to remove from horizontal surfaces.

Huang et al does not disclose use of methylsequiazane as the low-k layer 206, direct patterning of the methylsequiazane layer using masked UV or e-beam irradiation or formation of layer 212 by atomic layer deposition (ALD).

AAPA is applied as stated in the office action mailed 10/28/03 as providing motivation to employ methylsequiazane as the low-k material 206 including direct patterning using masked UV or e-beam irradiation followed by developing in TMAH.

Lopatin is relied on as stated in the office action mailed 10/28/03 as providing motivation to form the barrier layer 212 of Huang et al using ALD.

One of ordinary skill in the art would have been led to the recited thickness of layer 206 through routine experimentation to achieve desired device dimensions and therefore desired device performance and desired device density on the finished wafer.

Claims 14 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Huang et al (6313028), of record, and applicant's admitted prior art (AAPA) as applied to claims 1-9,16-19,21-27,29 and 30 above, and further in view of Shachan-Diamand et al.

The combination does not include electroless deposition using contact displacement method.

Shachan-Diamand et al is relied on as stated in the office action mailed 10/28/03 as providing motivation to employ electroless deposition using contact displacement method as the method of forming Cu layer 214 of Huang et al.

It would have been within the scope of one of ordinary skill in the art to employ the method of Shachan-Diamand et al to form the Cu layer 214 of the combination with the expectation that increased discharging would occur as disclosed to be an issue with respect to prior art figures 1A-1C of Huang et al as a result of not employing the disclosed selective Cu deposition method.

Claims 11-13 and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Huang et al (6313028), of record, and applicant's admitted prior art (AAPA) as applied to claims 1-9,16-19,21-27,29 and 30 above, and further in view of Kaloyeros.

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The combination does not include low-T MOCVD as the selective CVD method to form the Cu layer 214 or use of the source gases required by claims 12, 13, 26 and 27.

Kaloyeros is relied on as stated in the office action mailed 10/28/03 as providing motivation to employ low-T MOCVD as the selective CVD method to form the Cu layer 214 and use of the source gases required by claims 12, 13, 26 and 27 as the method of performing the disclosed selective CVD method of Huang et al.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0956 until 2/4/04. See MPEP 203.08.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner George Fourson whose telephone number is (571)272-1860. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (571)272-1855. The fax number for this group is (571)273-0224 and the customer service number for group 2800 is 571-272-2800. Updates can be found at <http://www.uspto.gov/web/info/2800.htm>.

  
George Fourson  
Primary Examiner  
Art Unit 2823

GFourson  
March 1, 2004